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# THE MILKING MACHINE A SOURCE OF BACTERIAL CONTAMINATION OF MILK \*

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In some localities hand milkers are being rapidly replaced by more or less complicated machines that do the milking in what has been assumed to be the most sanitary way. Some of this machinery, however, is not very easily kept clean and may therefore become a source of contamination to rival the most careless hand milker.

In a recent bacteriologic study of the milk delivered to the retailers in LaSalle and Peru I found that those milks which had been drawn by a milking machine almost invariably gave higher bacterial counts than those which had been drawn by hand. This fact is clearly brought out by the following table of the average counts for 2 months:

TABLE 1  
THE AVERAGE BACTERIAL COUNTS FOR MILKS DELIVERED TO THE RETAILERS IN LASALLE AND  
PERU DURING MAY AND JUNE, 1916

Dairy (Milk Drawn by Machinery)	Number of Bacteria per c.c.	Dairy (Milk Drawn by Hand)	Number of Bacteria per c.c.
B	2,733,000	E	1,795,000
F	2,823,000	En	52,500
G	1,435,000	Ma	113,000
J	1,195,000	Me	276,000
M	2,630,000	R	140,000
S	785,000	Sr	315,000

The table shows plainly that milk drawn with a milking machine may give a much higher bacterial count than milk of the same age which has been drawn by hand. It should be stated, however, that this difference is not generally so marked during cold weather as during warm weather.

These rather surprising results led me to visit every dairy in this vicinity where a milking machine is used, with a view to determining just where the trouble lay. In this investigation sterile wide-mouthed bottles in a small ice box were taken out to the farms and samples collected at different stages of the handling of the milk, for bacteriologic examination. As a rule 2 cows were milked at the same time

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with 1 milking machine. Before the milking machine was started, we drew a small quantity of milk from 2 cows into a sterile bottle and immediately placed it on ice. The cups of the machine were then put on those cows, and after they were milked dry, another sample was poured into one of our sterile bottles and placed on ice. The teat cups, tubes, and milking can of the milking machine were then rinsed with clean cold water and sterilized by drawing a pailful of boiling hot water through them. After the cups had cooled sufficiently so that they could be attached to the teats, a second pair of cows was milked with the machine and a sample poured into a sterile bottle and placed on ice. These samples were then immediately transported to the laboratory, where they were plated in 1% acid agar and the colonies counted after incubation at 36 C. for 48 hours. The results, which were very striking, are shown in Table 2.

TABLE 2  
COMPARISON OF THE BACTERIAL COUNTS FROM MILK DRAWN BY HAND, BY UNSTERILIZED MILKING MACHINES, AND BY MACHINES THOROUGHLY SCALDED

The Manner in Which Milk Was Drawn	Dairy B	Dairy F	Dairy G	Dairy J	Dairy M	Dairy S
By hand into a sterile bottle.....	860	.....	556	1,200	11,600	12,800
With milking machine as generally used .....	2,450,000	190,000	432,000	320,000	660,000	266,000
With same milking machine after thorough scalding of the teat-cups, tubes, and can with boiling water .....	2,430	12,500	16,000	5,000	130,000	6,000

The figures show clearly that milk may be grossly contaminated by the use of an improperly cleaned and unsterilized milking machine. These farmers had been instructed by the agent who sold them the milking machine to rinse the cups, tubes, and cans with cold water after each milking and then to lay the tubes and cups into a tub of clean water until the next milking. This was done just as they had been instructed except that some of them placed the tubes and cups into a solution of "B-K" or a solution of chlorinated lime. The water or solution in these tubs was changed twice a week, and once each week the cups and tubes were cleaned with a brush and "scalded." The "scalding," however, was done with water that was only hot enough to "feel hot" to the finger.

It is a well known fact that milk utensils and rubber tubes through which milk has been drawn cannot be properly cleaned by merely rinsing with cold water. When we consider the fact that this milk was

drawn through rubber tubes which are about 3 feet long and which have several connecting joints, and that they were cleaned only once a week, we are not greatly surprised at the results. The filthiness of the connecting joints and of the interior of these tubes in hot weather can easily be imagined.

#### CONCLUSION

Milk may be badly contaminated by a milking machine if the teat cups and rubber tubes are not carefully cleaned and scalded before each milking.

Immersing the cups and tubes in a solution of "B-K" or chlorinated lime does not satisfactorily prevent bacterial growth in the tubes.

A mere inspection of the dairy without bacteriologic control of the milk may fail absolutely to locate an unsanitary process in the production of that milk. All our dairies are inspected by a veterinarian every 3 months and are given fairly high scores, but he has never discovered the fact that the milking machines are not properly cleaned and scalded.